

# First flea (Siphonaptera) records for Kanuti National Wildlife Refuge, Central Alaska.

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## ABSTRACT

Kanuti National Wildlife Refuge (KNWR) was established in 1980 in Central Alaska. Collections of mammal fleas began in 1991. Six species resulted: *Catallagia dacenkoi* Ioff, *Corrodopsylla curvata* (Rothschild), *Ctenophthalmus pseudagyrtes* Baker, *Megabothris calcarifer* (Wagner), *Amalaraeus dissimilis* (Jordan) and *Peromyscopsylla ostsibirica* (Scalon). Ten species of fleas were previously recorded from the upper Koyukuk River watershed. One female specimen each of *C. curvata* and *Ct. pseudagyrtes* from the KNWR are the only new fleas added to the upper watershed list.

**Key Words:** fleas, Siphonaptera, mammal hosts, Alaska

## INTRODUCTION

The upper Koyukuk River watershed in Central Alaska (MacDonald and Cook 2009: Figs. 10, 12, pp. 33, 34) was mostly an unknown Arctic wilderness before 1929 (Figure 1). The earliest systematic comprehensive mapping survey of the topography of this large area from the Brooks Range south to the Arctic Circle was accomplished from 1929 to 1939 primarily by R. Marshall (1956: maps pp. 6, 34, 35, 111, 143 + folding map). Flea collections begun in 1955 were facilitated by accurate detailed maps showing rivers, lakes and villages.

Recent collections in Kanuti NWR since 1991 benefitted from instruments for determining georeferenced locality coordinates.

The length of KNWR north of the Arctic Circle is ca. 35 km and ca. 63 km south of it. The south portion extends from 66°33' to slightly more than 1 km south of 66°00'. Collections by Patsy Martin are nearest the Arctic Circle at 66°19'9", i.e., 13'51" south of 66°33'. Marshall's maps only extend ca. 10 km south of the Arctic Circle. Thus, they could not be used to confirm KNWR localities.

## MATERIALS AND METHODS

Collecting began in KNWR on 9 September 1991 when Patsy Martin recorded AF1115 (UAM22104) ex *Myodes* (formerly *Clethrionomys*) *rutilus* near small lakes south of the Arctic Circle at 66°19'0"N, 151°47'0"W. On 10 and 11 September 1991 8 additional AF records had *Sorex cinereus* Kerr (1), *Synaptomys borealis* (Richardson) (1), and *Microtus pennsylvanicus* (2) as well as *My. rutilus* (4). We have not seen the fleas in these 9 collections nor in AF1644 (UAM46647) recorded by Aliy Zirkle on 27 August 1993, south of the Arctic Circle at

66°18'12"N, 151°46'30"W. Most flea specimens that we obtained had complete field collection data that facilitated identifications. Field collection years were 1991 (fleas not seen), 1992, 1993, 1996 and 2006. Patsy Martin was the most active collector. Other contributors were A. Zirkle, J. Bopp, and R. Brubaker. More recently, specimens (2006) were collected by L. Saperstein. Her new collections are welcome compensation for fleas missing in 1991 and 1993 (see below). All localities were south of the Arctic Circle. Six species of fleas from 7 species of

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mammalian hosts from KNWR were studied. Note that we received a report that whatever fleas were collected by Martin in 1991 and Zirkle in 1993 were transferred from the Nixon Wilson collection to the University of Nebraska, Lincoln collection for curation in 2012.

Acronyms identifying collectors of flea specimens mainly in the species accounts are as follows: AZ=Aliy Zirkle; JB=Jesse Bopp; PM & PAM=Patsy Martin; RB=Rachel Brubaker; LS=Lisa Saperstein.

After receiving one or more fleas in a vial of 70% ethanol containing an AF label matching the AF for the mammal host on data provided by University of Alaska, Fairbanks, all specimens were permanently slide-mounted in Canada balsam. Technique for slide-mounting is as specified in Haas *et al.*, 2005.

#### KANUTI NWR SPECIES ACCOUNTS CTENOPHTHALMIDAE

*Catallagia dacenkoi* Ioff, 1940

Material examined: USA: AK: 66°19.4'N, 151°46.9'W, 1♂ from *Microtus oeconomus* [AF1585; UAM47004], 28.viii.1993, AZ. 66°18'43"N, 151°46'32"W, 1♂, 1♀ from *M.*

*oeconomus* [AF18469; UAM38386], 9.viii.1996, PM. 66°18'45"N, 151°45'59"W, 1♀ from *Microtus pennsylvanicus* [AF18466; UAM41561], 8.viii.1996, PM. 66°19'9"N, 151°47'41"W, 1♂, 1♀ from *Myodes rutilus* [AF18454; UAM38338], 1.ix.1996, PM. 66°19'9"N, 151°47'41"W, 1♀ from *M. rutilus* [AF18450; UAM38334], 2.ix.1996, PM. 66°19'9"N, 151°47'41"W, 1♂ from *My. rutilus* [AF18449; UAM38333], 3.ix.1996, PM. 66°19'9"N, 151°47'41"W, 1♀ from *My. rutilus* [AF18459; UAM38343], 3.ix.1996, PM.

**Remarks:** This common Holarctic flea is a parasite of the voles *Myodes rutilus*, *Microtus oeconomus* and *Microtus pennsylvanicus* in Alaska. Its vestigial eye indicates it has the behaviour of a nest flea. It ranges across Alaska eastward to the Yukon Territory, then east-southeast as far as Manitoba (Holland 1985: Map 16). Its range in Alaska has several large regions that lack records: Southeast Panhandle, North Slope, extreme Southwest, Kenai Peninsula, and land in and around Prince William Sound. There appears to be a maritime factor that precludes *C. dacenkoi* from coastal habitat with a few exceptions: Unalakleet, Stebbins, St. Michael along the



**Figure 1.** Map of Alaska showing central location of Kanuti National Wildlife Refuge in the upper Koyukuk River watershed and straddling the Arctic Circle.

Table 1

Seven mammalian hosts of six taxa of fleas with present records for Kanuti National Wildlife Refuge, central Alaska.

Mammal	Fleas (Siphonaptera)
Rodentia: Cricetidae <i>Lemmus trimucronatus</i> (Richardson), brown lemming	Ctenophthalmidae, Ceratophyllidae <i>Peromyscopsylla ostsibirica</i> (Scalon, 1936)
<i>Microtus oeconomus</i> (Pallas), root vole	<i>Catallagia dacenkoi</i> Ioff, 1940 <i>P. ostsibirica</i>
<i>Microtus pennsylvanicus</i> (Ord), meadow vole	<i>C. dacenkoi</i>
<i>Microtus xanthognathus</i> (Leach), taiga vole	<i>Ctenophthalmus pseudagyrtis</i> Baker, 1895 <i>Amalaraeus dissimilis</i> (Jordan, 1929)
<i>Myodes rutilus</i> (Pallas), northern red- backed vole	<i>C. dacenkoi</i> <i>P. ostsibirica</i> <i>Megabothris calcarifer</i> (Wagner, 1913) <i>A. dissimilis</i>
<i>Synaptomys borealis</i> (Richardson), northern bog lemming	<i>M. calcarifer</i>
Soricomorpha: Soricidae <i>Sorex cinereus</i> Kerr, cinereus shrew	<i>Corrodopsylla c. curvata</i> (Rothschild, 1915)

In Table 1, the mammal column shows *Microtus* spp. and *Myodes* sp. are dominant. Their fleas are almost entirely common species. The exceptional collection of the *Ctenophthalmus pseudagyrtis* specimen from *Microtus xanthognathus* in Kanuti NWR extended this flea’s continental range northward roughly 100 km. A series of three brown lemmings totaled four female *P. ostsibirica* specimens. A northern bog lemming only had one female *M. calcarifer*. Another mammal with only one female flea specimen (*C. c. curvata*) is the cinereus shrew, a rarity in Kanuti NWR that suggests testing different traps and live baits for shrews.

Bering Sea coast and at the head of Cook Inlet in Southcentral Alaska (Holland 1985: Map 16; Haas *et al.* 1989: p. 399, Map 3; MacDonald and Cook 2009: Figs. 14, 16).

*Catallagia dacenkoi* might have been preceded to east Beringia by its uncommon Holarctic congener *C. ioffi* Scalon, 1950, now restricted to YT, northern BC and southern Alberta. In a review of the 15 species of *Catallagia* in North America, Lewis and Haas (2001: pp. 57-59, Figs. 15, 29, 43, 57) determined that *C. jellisoni* Holland, 1954 is a junior synonym of *C. ioffi* Scalon. Its closest known approach to Alaska from the east is Swede Dome, YT (Holland 1985: p. 101, Map 17).

*Corrodopsylla c. curvata* (Rothschild, 1915)

Material examined: USA: AK: 66°18'43"N, 151°46'32"W, 1♀ from *Sorex cinereus* [AF17817; UAM38366], 8.viii.1996, PM.

**Remarks:** Only this one shrew and its single flea were collected. It took until the last year (1996) of collecting in KNWR for this success by P. Martin. *Sorex cinereus* is recorded along the Koyukuk R. and over most of Alaska but not the North Slope and the Yukon-Kuskokwim R. delta (MacDonald and Cook 2009: Map 35). Records of *C. c. curvata* are sparse in Holland (1985: p. 189, Map 36) with a large void west of the Yukon-Tanana confluence. Later however, Haas *et al.* (1989:



Map 2) recorded 19 ♂♂ and 19 ♀♀ collected by T.O. Osborne along the Yukon R. between Galena and the Yukon-Koyukuk R. confluence. Six new records of shrew fleas in western Alaska had been published (1982), and four were along the Bering Sea coast. The symbols for these records appear on distribution map 2 of Haas *et al.* (1989: p. 398). Records (Bering Sea shore): Nelson Island, Toksook Bay, 1 ♀ from *Sorex monticolus*, 25.ix.1978 and Hooper Bay, 1 ♂ from *S. monticolus*, 28.vii.1980 (Haas 1982). Scammon Bay, 2 ♂♂ 1 ♀ from *S. monticolus*, 13.vi.1980, GEH & Goodman: same data but 1 ♂ from *M. oeconomus* (Haas *et al.* 1982). Records (inland): Yukon R., Holy Cross, 1 ♀ from *S. monticolus*, 28.viii.1979 and Kuskokwim R., Tuluksak, 1 ♀ from *S. cinereus*, 1.viii.1980 (Haas *et al.* 1982).

*Ctenophthalmus pseudagyrtis* Baker 1895

Material examined: USA: AK: Mouse Lake, 66°18'47.22"N, 151°45'54.18"W, 1 ♀ from *Microtus xanthognathus* [AF40419; UAM87607], 25.viii.2006, LS.

**Remarks:** Haas *et al.* (2010) noted the incongruity of the known range of this flea with the huge range of its main host, *Microtus* spp. This collection establishes the most northerly known record of this species in Alaska and in the Koyukuk River watershed.

#### CERATOPHYLLIDAE

*Megabothris calcarifer* (Wagner, 1913)

Material examined: USA: AK: no coordinates, 1 ♂, 1 ♀ from *Myodes rutilus* [AF1585; UAM47004], 13.ix.1992, RB. 2nd record same data but [AF1577, UAM36776]. 66°19'9"N, 151°47'41"W, 1 ♀ from *My. rutilus* [AF18459; UAM38343], 3.ix.1996, PM. Mouse Lake, 66°18'47.22"N, 151°45'54.18"W, 1 ♀ from *Synaptomys borealis* [AF40305; UAM87674], 27.viii.2006, LS.

**Remarks:** This flea stands out as the only one of 12 that was collected in KNWR and the three villages of Allakaket, Bettles and Wiseman. This is no doubt a sign of small samples: more data are needed from KNWR. Collection data were recorded there in April, August and September. May, June and July would undoubtedly be productive. *Megabothris calcarifer* is a common and abundant Holarctic vole flea that prefers Holarctic *My. rutilus* and *Mi. oeconomus*. It ranges over much of Alaska, even as far as

Hudson Bay according to Holland (1985: Map 78). The Southeast Panhandle has no records. Four diverse distribution maps are available: Hopla (1965: Map 8); Haddow *et al.* (1983: p. 109, Map 82, as *Megabothris asio gregsoni* Holland, 1950); Holland (1985: pp. 355-359, Map 78); Haas *et al.* (1989: p. 399, Map 4). Lewis (2009) discussed the uncertain taxonomic status of the *Megabothris asio-calcarifer* complex. Are there two species in North America or only one? If two, do they each have two of more subspecies? Holland (1985: pp. 355-359) retained *M. calcarifer* for his many New Alaska Records and stated *M. asio asio* (Baker, 1904) "... has not been reported for Alaska ... " nor did he mention, list or map (77) *M. asio megacolpus* (Jordan, 1929) in Alaska.

*Amalaraeus dissimilis* (Jordan, 1929)

Material examined: USA: AK: 66°19.36'N, 151°46.98'W, 1 ♀ from *Microtus xanthognathus* [AF1583, UAM46995], 28.viii.1993, AZ. 66°19.4'N, 151°47.0'W, 1 ♂ from *Myodes rutilus* [AF1584; UAM47239], 28.viii.1993, AZ. 66°19'9"N, 151°47'41"W, 1 ♀ from each of 3 *My. rutilus* [AF18451 (UAM38335), AF18450 (UAM38334), AF18454 (UAM38338)] and 1 ♂ 3 ♀♀ from *My. rutilus* [AF18460 (UAM38344)], 1.ix.1996, PM. Mouse Lake, 66°19'20.94"N, 151°46'58.02"W, 7 ♀ from *My. rutilus* [AF40221 (UAM87427)], 26.viii.2006, LS.

**Remarks:** The most prolific, wide-ranging vole flea in Alaska except for the Southeast Panhandle is Amphi-Beringian *Amalaraeus dissimilis*. Its two preferred hosts are *Myodes rutilus* and *Microtus oeconomus*. Collections along the Koyukuk R. were successful at all study areas except Bettles. Available distribution maps are those of Hopla (1965: Map 7); Haddow *et al.* (1983: p. 14, Map 8); Holland (1985: Map 86); Lewis (2008: Fig 2A). Hopla (1965: pp. 159, 161 Table XV) noted the sustained population of this most common microtine flea throughout the year. Haas *et al.* (1989: pp. 400-401) also noted *A. dissimilis* is the most common, wide-ranging flea of *My. rutilus* and *Mi. oeconomus*. Haas (1982) found that *A. dissimilis* was more abundant in vole nests than any other species of flea found in the nests. For example: of 14 species of vole fleas found in nests in Alaska, *A. dissimilis* led in five of six measurements: Total specimens (939), Total specimens reared

(417), Maximum number in a nest (388), Number of nests infested (91) and Total number of localities (40).

#### LEPTOPSYLLINAE

*Peromyscopsylla ostsibirica* (Scalon, 1936)

Material examined: USA: AK: 66°19'9"N, 151°47'41"W, 1 ♀ from *Lemmus trimucronatus* [AF17981; UAM47025], 2.ix.1996, PM & JB. 66°19'9"N, 151°47'41"W, 1 ♀ from *L. trimucronatus* [AF18400; UAM38294], 2.ix.1996, PM. 66°19'9"N, 151°47'41"W, 2 ♀♀ from *L. trimucronatus* [AF18406; UAM38300], 2.ix.1996, PM. 66°18'43"N, 151°46'32"W, 2 ♂♂ from *Microtus oeconomus* [AF17818; UAM38379], 8.viii.1996, PM. 66°19'9"N, 151°47'41"W, 1 ♂ from *Myodes rutilus* [AF18449; UAM38333], 3.ix.1996, PM. 66°18'43"N, 151°46'32"W, 1 ♂ from *Microtus pennsylvanicus* [AF17826; UAM41541], 7.viii.1996, PM. Mouse Lake, 66°19'20.94"N, 151°46'58.02"W, 1 ♂ from *My. rutilus* [AF40221; UAM87427], 26.viii.2006, LS.

**Remarks:** This flea is an Amphi-Beringian parasite of Holarctic *Microtus oeconomus*, secondarily *Myodes rutilus* with several records in the YT has most of its records in central and south-central Alaska. None is in the southeast Panhandle or the North Slope. It is primarily found in the interior forests, as in Siberia, with a few exceptions. It reaches tidewater at the head of Cook Inlet and on tundra at Nome and Unalakleet (Holland 1985: pp. 238-242, Map 51). Haas *et al.* (1989: p. 401, Map 7) noted its wide distribution in taiga and over tundra with a tidewater record at Toksook Bay, Nelson I. (Haas *et al.* 1979). A survey of fleas in vole nests confirmed collection of *P. ostsibirica* from *Mi. oeconomus* on tundra at Toksook Bay and added Goodnews Bay (Haas 1982). Hopla observed over several years that adults of *P. ostsibirica* first appeared on hosts around the end of July. Haas *et al.* (1978) agreed on the timing of adult emergence behaviour.

## DISCUSSION

Excluding missing fleas of 1991 and one of 1993, field workers were only able to collect five common species of Alaska mammal fleas from host rodents and a shrew in KNWR in 1992, 1993 and 1996 (Table 1). Two additional species of mammal fleas recorded by an earlier collector from Allakaket and Bettles are so close to KNWR that field workers can walk across the boundary to add red squirrel fleas, *Ceratophyllus vison* Baker and *Orchopeas caedens* (Jordan). The nest flea of voles, *Amphipsylla marikovskii* Ioff & Tiflov, is another species within walking distance of KNWR. The Arctic ground squirrel flea, *Oropsylla alaskensis* (Baker), occurs north and south of KNWR with no records between. Similarly, the lemming and vole flea, *Megabothris groenlandicus* Wahlgren, was recorded from *Microtus* voles at the northern location of Wiseman although there are more southern records such as along the Yukon River east of the confluence with the Koyukuk River. Brown bears, *Ursus arctos* Linnaeus, occur along the Koyukuk River and

necessitate different flea collecting techniques by field workers who trap small mammals. The nearest bear record was on the Middle Fork near Wiseman. One female flea, *Chaetopsylla tuberculiceps* (Bezzi), was collected by an unknown technique from a Brown bear.

Holland (1985: pp. 481-487, 489-493) listed mammals that have records of fleas in Alaska. MacDonald and Cook (2009) have 13 mammal distribution maps with symbols showing where the species occur in the upper Koyukuk River watershed. Their fleas are totally unknown. Some hosts might have just one or two accidental fleas, but such records are nonetheless of interest. These potential host mammals are the following: singing vole, snowshoe hare, pygmy shrew, dusky shrew, tundra shrew, Canadian lynx, red fox, American black bear, wolverine, American marten, ermine, least weasel, American mink. Collecting fleas from carnivores can require years in the field instead of months compared with small, abundant, easily trapped and handled rodents.

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